to examine this near approach more closely, particularly as Bouvard's Tables of Saturn were used for 1879. According to Leverrier's Tables, the position of Saturn from Bouvard requires corrections of about + 1·79s. in Right Ascension, and − 0″·4 in Declination; whence, with Leverrier's place of Mars the conjunction in right ascension occurs at 8h. 3·7m. G.M.T., and at this time the geocentric difference of declination is 1′ 29″·0. The apparent semi-diameter of Mars (taking 9″·45 for the diameter at mean distance) is 4″·46, and the apparent polar semi-diameter of Saturn, 7″·83; the horizontal parallaxes, 8″·36 and 0″·93 respectively. Hence it is evident that there will be no approach to an occultation. At conjunction the planets will be below the horizon in this country, but will be near the meridian at our Australian observatories; there, however, the least distance between the south limb of Mars and the north limb of Saturn will, according to the Tables, exceed a minute of arc. Mr. Marth has pointed out that the last close conjunction of Saturn and Mars took place on April 18, 1817; the *Berliner Jahrbuch* for that year gives the time of conjunction at 7h. M.T. at Berlin, with Mars 1′ S. of Saturn.

An occultation of Saturn by Mars, so far as we know, has not yet been put upon record, nor suspected before the invention of the telescope. The earliest mention of a near approach of the two planets is found in the Chinese annals during the latter days of the 10th moon, A.D. 27; on this occasion Mars, Jupiter, and Saturn were all situate within about 2° from the bright star Regulus; and the same annals record that on July 23, A.D. 143, Mars was very near to Saturn.

BIOLOGICAL NOTES

NATURAL SELECTION AMONG LARVAL SALAMANDERS.—Every case illustrating survival of the fittest has its own interest, as well as its bearing on general laws. The New England salamanders lay large numbers of eggs attached to water plants, and the larvæ are very interesting to watch. In a group that was studied recently, cannibal tendencies soon developed, the stronger eating off the gills of the weaker, at the same time being able to protect their own, within a week or ten days after hatching; these cannibals were fifty per cent. larger than their brethren, and, soon waxing bolder, they began to swallow them bodily. After ten days of the results of such feeding, they were ten or twelve times the size of such weaker brethren as were still left alive. Thus they rapidly developed and passed out of the gill-bearing stage. See Mr. S. F. Clarke, in *American Naturalist* for September.

THE MUSCLES OF THE MAMMALIAN FOOT.—Dr. D. J. Cunningham (*Journal of Anatomy and Physiology*, October, 1878), after dissecting the manus and pes of a large number of mammals, finds that the typical arrangement of the intrinsic muscles of the foot is the same as in the hand, and that this is best seen in certain marsupials. In these animals the muscles are disposed in three layers (1) a plantar layer of adductors; (2) an intermediate layer of short flexors; and (3) a dorsal layer of abductors. Deviations from the type may take place by suppression or by fusion of certain elements of the different layers. Fusion of the members of the intermediate and dorsal layers is very common. The presence of an opponens muscle is not accounted for in the foregoing disposition. When present Dr. Cunningham regards it as derived most commonly from the short flexor, but in many of the carnivora it proceeds from the plantar layer. Further, it is found that in many animals the relation of the intrinsic muscles to the metatarsal bones, both as regards their origin and position, corresponds with transitory conditions in the foot of the human embryo. The adult dog agrees exactly with the first stage of the human fœtus in the relation of the intrinsic pedal muscles to the metatarsals; the bones are closely compressed together, and the muscles are entirely plantar in position.

SENSITIVE ORGANS IN ASCLEPIADACEÆ.—Robert Brown gave it as his opinion, based on experience, that fertilisation in this family of plants depends largely upon insect agency. Dr. J. G. Hunt has recently published observations on *Stapelia asterias*, whose flower has an extremely disagreeable and animal odour, which appears to attract many flies. Under observation flies were seen eagerly applying their tongues all over the petals and essential organs, apparently eating, with an almost intoxicating relish, the excretion covering those parts. This banquet was indulged in with safety until their tongues came in contact with one of five black spots situated near and alternate with the stamens, when, with amazing quickness, the fly was seized and firmly held by the tongue—a hopeless prisoner. Now a struggle commenced, and if the fly was small and not vigorous, he was retained; if large and strong he escaped, dragging away the black spot and also the pollen-masses, two of which are attached to each trap. The adhesion of the fly's tongue is not caused by any viscid liquid, but by a capital pair of blades, which, when touched lightly by a fly, or even a hair, close instantaneously, and secure the object. Two species of Asclepias have been examined by Mr. Edward Potts, and in these he finds that each anther has a pair of sacks or cases in which the pollen masses are suspended so as to make their withdrawal easy. They are closely adherent to the stigma. The sensitive glands are placed in shallow depressions upon the perpendicular columnar ridges of the stigma. The fact of the removal of the pollen masses by insect agency is well known; the question to determine was whether the glands had anything to do with the removal. Mr. Potts caught house-flies and held them by their wings above the flowers, allowing their feet to scramble over them. Almost immediately one or more of these would become ornamented with groups of the glands and pollen-masses, which clung so closely that their later struggles and rubbings failed to detach them. When separate hairs were directed on to a gland, the latter instantly contracted and clung to the hair, tearing itself loose from the stigma, and carrying away the pollen masses with it. On one of the species of Asclepias Mr. Potts noticed three flowers which, in addition to its own complete anthers, had one other sensitive gland and its attached pollen-masses, inserted under the edge of a normal anther, and against the sloping lower surface of the stigma. The development of these adventitious pollen-masses was traced till they put forth a profusion of pollen-tubes into the stigma, and the ovaries began to increase in size. Dr. Asa Gray mentions self-fertilisation as occurring in this genus by a similar growth of bundles of pollen-tubes penetrating the stigma at its lower extremity. But here in the presence of the foreign pollen-masses none of the home-grown ones had put forth pollen-tubes. It is conjectured that the maturity of the pollen-masses is reached so late that the stigma of the same flower is frequently unsusceptible. But if the pollen-masses from earlier flowers are removed by insects and lodged upon another just opened, they develop pollen-tubes, and cross-fertilisation ensues. Thus the sensitive glands are not for capture of insects, but to favour cross-fertilisation. (*Proceedings*, Acad. Nat. Sci. Philadelphia, 1878).

THE INHALATION OF PHOSPHURETTED HYDROGEN.—Dr. T. B. Henderson, of Glasgow (*Journal of Anatomy and Physiology*, October, 1878), has investigated the physiological effects of the inhalation of phosphuretted hydrogen gas, by inclosing an animal in an air-tight chamber of known capacity, and subsequently introducing into this a given quantity of the gas. In the first experiment a strong rat was placed in an atmosphere consisting almost entirely of phosphuretted hydrogen, and death

occurred in about ten minutes. An atmosphere containing one per cent. of the gas was found to prove fatal within half an hour. In the case of a large female rabbit, 0·2 per cent. caused death in thirty-three minutes. In these cases the most marked symptom was that of great increase in the number of respirations. Before death, respiration became slow and laboured, and convulsions resembling those of opisthotonus occurred. The ventricles of the heart became most powerfully contracted. Where the strongest dose was administered, the effect on the heart was most marked, and the lungs appeared unaffected. When small quantities of the gas were used, within a very short time the animals began to show signs of suffering from intense irritation of the skin, scratching and biting at it incessantly. Afterwards the creatures seemed to become drowsy, and assumed a very peculiar attitude, sitting down on all-fours, the back bent upwards, and nose pushed backwards between the fore-paws, so as to bring the forehead against the floor of the cage; a rat in this position looked very much like a curled-up hedgehog. A fatal result occurred when the quantity of gas was so small as 1 to 5120. In no case could the odour of the gas be detected in any organ of the body after death. The gas did not appear to exert any local action on the skin.

STRUCTURE AND AFFINITIES OF CHARACEÆ.—This difficult problem has been the subject of recent discussion in the pages of Trimen's *Journal of Botany*. The first paper was in the July number, by Mr. A. W. Bennett, who gave his reasons for dissenting from some generally accepted views of the structure of *Chara*, and from its assignment by Sachs to a place among the Carposporeæ. He objects in the first place to the use of the term "pro-embryo" (Vorkeim) for the immediate product of the germination of the spore, the homologue of the protonema of a moss, and not of the pro-embryo nor suspensor of Selaginellaceæ and Phanerogams. The term sporangium is also frequently misapplied to the nucule, which is in reality an archegonium. The so-called "sporocarp" is formed before and not as the result of fecundation. Finally, Mr. Bennett maintains that Characeæ differ from all the other higher cryptogams in the absence of any alternation of generations, the nearest affinity being with Muscineæ, which they approach in their organs of reproduction. In the September number Prof. Caruel expresses his agreement with Mr. Bennett in removing the Characeæ from the Carposporeæ, but differs in his interpretation of the structure which is the immediate product of germination, the homology of which with the protonema of mosses he contests. He places them in a separate class of their own, intermediate between phanerogams and vascular cryptogams. Finally, in the number for December, Mr. S. H. Vines has a very elaborate essay on the subject. He agrees with both the previous writers in separating the Characeæ from the Carposporeæ, and with Caruel in disputing the homology of the "pro-embryo" with the protonema of a moss, but on the other hand again considers their nearest affinity, though remote, to be with Muscineæ. His principal object is to show that the "pro-embryo" is in reality the embryo of the plant, and that it constitutes in itself the non-sexual generation or sporophore, homologous with the sporogonium of mosses, notwithstanding the apparently anomalous fact that it never produces spores. For such a structure he proposes the term "aposporous sporophore," and compares it to the "apogamous" oophore or prothallium of *Pteris cretica* and some other ferns, which are anomalous in not producing sexual organs of reproduction.

GEOGRAPHICAL NOTES

THE fifty-sixth supplement to Petermann's *Mittheilungen* has just been published, and consists of a masterly treatise on Deltas, by Dr. G. A. Credner, of Halle. The author shows the importance of deltas in reference both to geography and geology, and discusses carefully the real import of the term. He then, in the first part of his work, treats of the Formation, Structure, Growth, and Distribution of Deltas under the heads of (1) Limit and Form of the Delta; (2) Formation and Condition of the Delta Surface; (3) Size of the Delta; (4) Its Power; (5) Its material; (6) Architecture; (7) Rate of its Growth; (8) Results of its Growth; (9) The Age of Deltas; (10) Number and Geographical Distribution of Deltas; (11) Classification of Deltas. The second part treats of the various causes of the origin of deltas, the causes and conditions of their formation, in which the author discusses various processes of great geological interest. Three sheets of maps accompany this most important paper, showing, among other points, the various deltas of the world.

WE are glad to learn of the early appearance of a work published in Russia under the editorship of M. Semenoff, President of the Geographical Society at St. Petersburg. The title is "Illustrated Russia," and it will give a geographical, historical, ethnographical, and statistical description of the country. We notice among the very numerous collaborators all the names well known in the Russian geographical world. The work will contain four folio volumes of sixty to seventy sheets each, and it will be accompanied with numerous illustrations, engraved by the best European firms. Another work of the same kind is undertaken by M. Mordovtseff—"The Ukraine (Little Russia): its History and its People." It will be on the same plan as the well-known work on "Bohemia: its History and its People."

WE are also glad to notice the appearance of the last volume of the "Works of the Ethnographical Expedition sent by the Russian Geographical Society." This volume deals with the south-western provinces of Russia. The expedition was undertaken in 1869, finished in two years, and the printing of the reports, which occupy seven large volumes, has taken since 1872.

WE find in the *Izvestia* of the Russian Geographical Society a notice of the journey of M. Mayeff in Southern Bokhara, last August. After having reached Karshi with an embassy sent to the Emir by the Governor-General of Tashkent, M. Mayeff visited the mountain pass, Ak-bash, which goes from Tenga-khoram to the Kerchak River, and to the great and wealthy village, Kuitan: thence he proceeded by the pass Tenga-daval to Shir-abad. The Kerchak River and its tributary, Kuitan-daria, both mighty mountain streams, were previously quite unknown. The Tenga-daval cleft cuts through the whole mass of the Kuityn-tau, the south-western part of Hissar ridge. From Shir-abad M. Mayeff, going further south, crossed the great Pashkhund ridge, reached the Surkhan river at Kakaity, and traced its banks down to Regar and Sary-djuy. Thence he returned to Shahri-sabs by a very bad route, hardly practicable even on horseback, along the rocky banks of the wild stream, Sengri-dagh. The surveys made during this journey are a most important acquisition for the geography of Central Asia; the highlands of Bokhara, quite unknown until now, will soon receive on our maps an outline in accordance with nature.

THE last number of the *Izvestia* of the Russian Geographical Society contains a report, by Capt. Sidensner, on the possibility of a water communication between the tributaries of the Obi and Yenissei; a very interesting paper, by M. Miclucho Maclay, on the Pelew archipelago, being a description of the people, its customs, administration, and religion; a necrology of M. Chaslavsky; and several notes:—On M. Mayeff's journey to Southern Bokhara, on the Russian cruises to the Obi and Yenissei, and especially statistical ones on printing in Moscow, on trade, ports, and telegraphs in Japan, and on the population and manufactures in governments Tula and Nijni-Novgorod.